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ABSTRACT

Self-efficacy and performance variables and technology adoption for secondary distance learning facilitators were studied. Subjects were 107 high school teachers who served as distance facilitators for an introductory Spanish course delivered from Kansas State University to 9 states (Alabama, Colorado, Kansas, Missouri, Mississippi, Montana, Oklahoma, Tennessee, and West Virginia). The distance facilitator is a teaching partner in the satellite locations who is required to learn Spanish along with the students. A survey was developed to measure self-efficacy, performance, and adoption of technology. Questionnaires were completed by 89 teaching partners, and telephone surveys were conducted with 32 principals. Teaching partners were found to be high vesters and low vesters. High vesters differ in their commitment, role effectiveness, and responsiveness to new technology; and they believe in their abilities to design instruction using new technology as a result of being distance facilitators. With the rapid growth of distance education, it is essential that a theory base be constructed in order to better serve the learning constituency. One figure and six tables present study findings. (Contains 43 references.) (SLD)

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Title:

Self Efficacy, Performance Variables and Distance Learning Facilitator Technology Adoption: Support for the Teacher Needs Hierarchy

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Innovation and Teacher Technology Adoption

Several investigators have pointed out that the success of reforms which rely on "outside" change agents, without sufficiently involving teachers, has been dismal (Aust, Bichelmeyer, & Allen, 1991; Dwyer, Ringstaff, & Sandholtz, 1990; Janowitz & Street, 1966; Johnson & Keller, 1981; Martin & Clemente, 1990). Cuban (1986) observed that

> teacher expertise [is] drawn from a pool of craft wisdom about children and schooling that dances beyond the limited understanding of nonteaching reformers... (pp. 5-6).

Snyder (1986), citing a Rand Corporation study of school innovations, observed that it is simplistic to assume that any new technology, regardless of how good it is, can be meaningfully adopted and maintained in the school system unless it takes into consideration the social and political climate of the school and places the teacher at the "dead center of the loop". "Historically, teachers use technologies that buttress, rather than undermine, their authority" (Bichelmeyer, 1991).

Investigators have found that teachers adopt new technological innovations around a cluster of factors: simplicity, durability, reliability, versatility (Johnson & Keller, 1981; Rogers, 1983), flexibility, time, communication (Kell, et. al., 1990), and developmental input (Aust, et. al., 1989). Kell and others (1990) reinforced these findings by naming five conditions that are conducive to change in the classroom: 1) a shared vision of teaching and learning, 2) leadership and support for new technology, 3) organizational conditions allowing flexibility, time, and incentives, 4) peer networking, and 5) training and personalized support.

Bichelmeyer (1991) expanded on these factors by proposing that teachers adopt technology innovations in a hierarchy of needs based on Maslow's Hierarchy (1968), with the most basic needs generally being fulfilled before higher ones: 1) time and accessibility, 2) dependability, 3) ownership and authority, 4) control, and 5) integration.

Maslow		*Bichelmeyer*
5 Self-Actualization		5 Integration
4 Esteem		4 Influence on Design
3 Belongingness		3 Ownership & Authority
2 Safety		2 Equipment Dependability
1 Physiological		1 Time and Equipment Accessibility

Figure 1: Hierarchy of Needs and Hierarchy of Teacher Technology Needs

Teacher Needs, Empowerment, and Technology Integration

This model is based on empowerment and accounts for 1) the centrism of the teacher, 2) the politics of the school, and 3) the practical logistics of classroom technology incorporation (Jackson, 1968; McDonald, J. 1989).

> "...Technological innovations that have been embraced by teachers are those that have solved problems which teachers themselves identified as important, regardless of what non-teachers say" (Bichelmeyer, 1991).

No other model of teacher technology adoption accounts for all of the above three factors.

Self-Efficacy and Technology Adoption

Central to the concepts of ownership and authority is "self-efficacy". Bandura's (1977) theory states that people develop beliefs concerning their own coping capabilities. The extent to which a belief is internalized by the teacher affects the value of an endeavor to that teacher. Teachers that internalize or vest a concept thereby increase their effectiveness in its use (Brophy, 1979; Gibson & Dembo, 1984). Teachers who believe that they have successfully integrated new technology tend to be teachers who successfully integrate technology into their instruction (Riggs,

1988). "If I master it, then I can internalize it" (Bichelmeyer, 1991, p. 138).

The Distance Facilitator as Technology Adopter

Satellite-based instruction is an instructional delivery mode serving over 125,000 students in 45 states through the S.T.A.R. Schools program alone (Office of Educational Research and Improvement, 1992), as well as other other independent and consortium providers, such as The Kansas Regents Educational Communications Center, TIE-IN, SERC, etc. While the distance facilitator's role varies somewhat worldwide (Harry, 1982; Parer, 1990; UNESCO, 1987), in the United States the term "distance facilitator" means anyone who facilitates distance learning--certified or uncertified and regardless of their duties. The "Teaching Partner" is generally a certified teacher who must learn a subject along with the students, provide course and equipment support for a high school distance class, and often must learn along with the students.

The distance facilitator plays a crucial role in student recruitment, retention, and persistence (Hobbs, 1990; Laube, 1992). Distance facilitators are considered necessary for effective foreign language instruction (Grier & Nelson, 1990). Research and evaluation data on distance facilitators in the United States have found that they have an average of four other preparations, are mid-career, are selected by their principals (rather than voluntarily asking to be assigned as facilitators), and are anxious about using new technology, such as satellite receivers, computers, and data streaming equipment (Dillon, 1990; Ford, 1990; Hobbs, 1990). Principals' reasons for facilitator selection are based on subject background, availability, and general teaching ability (Talab & Newhouse, 1990).

Research indicates that teachers and instructional designers are involved in similar basic activities (Applefield & Earle, 1990; Branch, Darwazeh & El-Hindi, 1992; Gagne, Briggs & Wager, 1992). Earle (1992) found that teachers believed that a knowledge of instructional design processes improved their planning. It is likely that these same processes may be internalized and thereby integrated through the facilitation of satellite instruction. For example, course elements include the regular observation of a "master teacher," training in the use of carefully selected

print, non-print, and instructional materials (syllabi, tests, worksheets, etc.), hardware training, and the chance to network with other facilitators on course progress (Talab, 1991a). Typical comments of distance facilitators about the teaching/learning experience are that they have gained from learning from an excellent teacher and that they professionally benefited from the opportunity to network with other teachers on methodology (Dillon, 1990).

Purpose of the Study

The purpose of the present study is to examine self-efficacy and performance variables and technology adoption for secondary distance learning facilitators. Secondary distance facilitators are a group that must, by the definition of satellite-based education, adopt the most recent technological advances available for instructional development and delivery. There are many differences between adult distance learning and learners and secondary distance learning and learners (Laube, 1992). To date, these issues have yet to be addressed.

Hypotheses

In order to find if any relationships existed between certain ownership/self-efficacy ("vesting"), performance variables and technology adoption the following hypotheses were developed:

1. A high vester will be more committed to continuing as a distance facilitator than the low vester.

2. A high vester will perceive him/herself as a more effective distance facilitator than the low vester.

3. A high vester will feel more comfortable with

with new technology than the low vester.

4. A high vester will be perceived by the principal as being a more effective distance facilitator than the low vester.

Methodology

Subjects and Setting

The subjects were 107 high school teachers who served as distance facilitators for an introductor Spanish course offered by the Regents Educational Communications Center (RECC) at Kansas State University. The course is offered in nine states: Alabama, Colorado, Kansas, Missouri, Mississippi, Montana, Oklahoma, Tennessee, and West Virginia. The RECC (and Kansas law) requires the presence of a distance facilitator ("teaching partner") for satellite-based courses. This person must be a certified teacher and the RECC requires that he/she learn Spanish along with the students. Training is not required for Teaching Partners, but most do take part in training and some come year after year. During training discussion groups for new (Spanish One) and experienced (Spanish Two) Teaching Partners were formed and surveys were conducted for formative evaluation purposes.

Variables

Variables for the Teaching Partner survey were based on Bichelmeyer's (1991) Hierarchy of Needs and Bandura's (1977) concept of self-efficacy. Self-efficacy refers to the internalization of a practice or principle and corresponds to the ownership and authority (3rd level) of the Teacher Needs Hierarchy. In Maslow's Hierarchy of Needs level 3 would be Belongingness.

The performance variable chosen was instructional design. If teachers felt that as a result of their being distance facilitators they could design instruction with new technology then they would likely exhibit more effective teaching performance with technology.

Instructional Design. They were asked if, as a result of being a Teaching Partner, they knew the steps necessary to using technology in the instructional setting.

Three self-efficacy variables were tested against the performance variable.

Teaching Partner Commitment. They were asked if they would like to continue as a Teaching Partner.

Responsiveness to New Technology. They were asked if they were more comfortable with using new technology as a result of being a Teaching Partner.

Role Effectiveness. They were asked if they were performing their duties well.

Instrumentation

In order to assess the relationship between ownership/self-efficacy (vesting) variables and performance an 81-item questionnaire was developed for Teaching Partners. The response format to questionnaire items varied and included items developed on a five, four, and three point Likert scale, multiple choice, and open ended response items. Eleven of the questions were adapted from Riggs' Science Self-Efficacy Instrument on Microcomputers (Riggs, 1988). The reliability of the performance variable was .82 and the reliability of the self-efficacy variables were: Variable 1 (commitment):.72, variable 2 (technology adoption):.81, variable 3 (role effectiveness):.75

A thirteen-item phone survey was constructed for Principals consisting of five point Likert, multiple choice, and open ended response items. In order to clarify survey questions an open-ended interview was conducted with sixteen Spanish One Teaching Partners participating in training.

Procedures

Questionnaires with stamped return envelopes were mailed in May, 1991, to all 107 distance facilitators. After two mail followups in July and August, 89 questionnaires were returned by late September, resulting in an 81% response rate. Phone surveys were conducted with 32 principals in late May and early June, constituting a one in five sample. After dropouts 29 facilitator-principals pairings were available for analysis.

Statistical Analyses

The first three hypotheses were tested by use of Chi Square analyses (with Yates Correction) comparing subjects' self-efficacy to performance variables. This was accomplished by dropping

the "undecided" group from the 5-part Likert scale and dividing the remaining groups into either high or low. The last hypothesis was tested using the Pearson Product-Moment Correlation to see if a relationship existed between self efficacy and principals' perception of Teaching Partner performance. Responses from the open-ended interview with Spanish One Teaching Partners were examined using a content analysis.

Hypothesis One

The results of the Chi Square test were significant ($X2=6.54$, $df=1$, $p<.01$) indicating that the high vester group differed significantly from the low vester group in their commitment to continuing as a Teaching Partner (see Table I).

Table I = Comparison of Self-Efficacy and Commitment

	Commitment		
Group	*No*	*Yes*	*Total*
Vesters	-0-	26	26
Non-Vesters	3	5	8
Total	3	31	34

$X2=6.54$ $df=1$ $p.<.01$

Missing Observations: 21

Hypothesis Two

The results of the Chi Square test were significant ($X2=15.29$, $df=1$, $p<.0001$) indicating that as a result of being Teaching Partners they feel comfortable with new technology.

Table 2 = Comparison of Self-Efficacy and Technology Adoption

	Technology Adoption		
Group	*No*	*Yes*	*Total*
Vesters	-0-	36	36
Non-Vesters	3	2	5
Total	3	38	41

X2=15.29 df=1 p<.0001

Missing observations = 14

Hypothesis Three

The results of the Chi Square test were significant (X2=3.99, df=1, p< .04) indicating that the high vester group differed significantly from the low vester group in their role attitudes.

Table 3 = Comparison of Self-Efficacy and Role Effectiveness

	Role Effectiveness		
Group	*No*	*Yes*	*Total*
Vesters	1	35	36
Non-Vesters	1	-0-	1
Total	2	35	37

X2=3.99 df=1 p<=.04

Missing Observations = 18

Hypothesis Four

The data were inconclusive. A Pearson Product-Moment Correlation could not be done due

the absence of comparable cells. Most principals rated the quality of the facilitator's performance highly, answering on a five-part Likert scale either "excellent" (14) or "very good" (13), for a total of 27 that were rated highly. One principal was also a facilitator and could not be included. One facilitator was judged to be "very poor" but responded in high vester group in all previous measures. No explanation was offered by the Principal for the poor evaluation. In addition, principals may have answered more positively in a phone interview than by mail, as principals will respond more positively to questions from interviewers from the RECC host campus phone survey for which they might be identified than those for which remain anonymous (Talab, 1991b).

Content Analysis of Facilitator Responses to Open-Ended Survey

Subjects were asked to identify what concerns they had as Spanish One facilitators. A total of 16 subjects provided responses, and most gave multiple responses for a total of 34 responses. A content analysis was conducted in order to aggregate similar responses into categories. Facilitator responses are ranked in order of frequency of response for each category. The results were two areas of concern: 1) instructional design (Table 5) and 2) classroom management (Table 6).

Table 5: Summary of Content Analysis of Facilitator Instructional Design Concerns

Identified Concerns	*Frequency of Responses**	*Rank*
differences between book emphasis and tv professor emphasis	6	1
course element timing during school year	6	1
the need for an anticipatory set	5	2
problems with question cards	4	3
should students write or speak first	4	3
coordinating activities	3	4
who speaks when on camera	3	4

*Total number of subjects responding = 16

Table 6: Summary of Content Analysis of Classroom Management

Identified Concerns	*Frequency of Responses*	*Rank*
School Schedules	9	1
planning time to work on materials	7	2
difference between facilitating and traditional teaching	6	3
need for in-class time for student work	5	4
varied responsibilities	3	5

*Total number of subjects responding = 16

Other statements of interest made by facilitators were that satellite-based instruction made the students responsible, that they learned to become better learners, and that other teachers were skeptical of facilitators because it looked like it was easy. Most (14) participants agreed that it was just as difficult as traditional teaching. Two participants believed that it was more difficult because of the management and technological demands.

Conclusions

Among the three self-efficacy variables tested for high and low vesters against the performance variable, there was a significant positive relationship found between instructional design and 1) commitment, 2) responsiveness to new technology, and 3) role effectiveness. No statistically significant relationship was found between principals' evaluation of facilitator performance and facilitators' self-appraisal.

Commitment

The results of this study support the findings of others (Bichelmeyer, 1991; Dillon, 1990; Reezabek, 1991; Talab & Newhouse, 1990). Mastering the technology for instruction was in large part a reason for facilitators to continue. It must be noted that facilitators generally do not volunteer and are hesitant about using technology (Hobbs & Osbourn, 1989). However, commitment to continue seems to be related to a large extent on program training and to a lesser extent on program implementation rather than the mere adoption of the technology or the position itself (Ford, 1990).

Technology Adoption

The finding that facilitators feel more comfortable with adopting new technology as a result of being a facilitator corroborates earlier research that presents a surprising consensus on faciliator duties, with one of the major duties being equipment operation (Simonson, Johnson & Neuberger, 1989; Mihalevich, 1990; Talab, 1990a). Kell et. al.'s finding (1991) that familiarization with the many forms of media and technology that are used in an exemplary class is also meaningful with regard to facilitator exposure to technology adoption through combined with training and modeling

by the master satellilte teacher. The one "caveat" is that technology training must be executed properly and technology implementation must be aided by communication with course personnel, since facilitator-perceived weaknesses with satellite-based instruction training center on technology and equipment training (Ford, 1990).

Role Effectiveness

The findings support those of Hobbs (1989) and Ford (1990) because of the high degree of instructional technology that must be mastered in order to fulfill the role. It seems evident that those who do feel that they have a high degree of self-efficacy in instructional design with technology would feel that they fulfill their role to a high degree (Reezabek, 1991).

Principals' Perceptions of Facilitator Role Effectiveness

The inconclusive findings could be indicative of either a high approval rating or an unwillingness on the part of principals to appear that satellite-based education is anything other than successful (Talab, 1990b). A feeling that is generally shared by school adminstrators, more so than facilitators, is that satellite-based instruction is an effective and inexpensive way to bring college preparatory instruction to rural and underserved areas and this could account for a generally positive response (Hobbs, 1990).

Discussion

The Importance of the Teacher Needs Hierarchy in School Restructuring

Support for this model can be drawn from the concept of self-efficacy. High vesters are different from low vesters in their commitment, role effectiveness, and responsiveness to new technology. They believe in their own abilities to design instruction using new technology as a result of being distance facilitators. In many ways they are representative of all teachers in their hesitance to learn the technology and the fact that they are generally selected to be facilitators rather than volunteering themselves. Yet they believe that as a result of being teaching partners they are now able and willing to continue in this role. By all accounts, distance facilitators have

successfully incorporated technology into their classrooms in an exemplary manner.

The question then becomes "why are the results so positive with satellite-based education in contrast to computer integration?" There could be several reasons. Studies show that teachers who become facilitators are no more conversant or willing to use satellite technology than they are to use computers (Hobbs, 1990; Reezabek, 1991; Talab & Newhouse, 1990). Yet most facilitators:

1) are committed to the concept of equality of education (college preparatory courses for underserved students) that satellite-based education provides,

2) see opportunities for professional advancement through learning new skills and professional networking;

3) seem revitalized by the observation of a master teacher and exceptional instructional design,

4) realize that the program will not work without their participation,

5) receive training in satellite-based instruction, either live or on tape, professional troubleshooting, and program feedback.

These findings also corroborate Bichelmeyer's Hierarchy of Teacher Needs because teachers are given time and accessible equipment (level 1), program personnel help them with machine operation and troubleshooting (level 2), they take part in training, program planning, and control the grading, classroom management, and classroom activities (level 3), they influence the program through feedback (level 4), and they see the need for technology integration in order to take part in the program (level 5).

While there is no research on the differences between facilitators and other teachers, a possible answer could be that the difference is philosophical. Teachers must indeed "internalize" the use of a new technology if the use is to be long-term and involve more than just the standard "top-down"--principal-teacher authority structure that has operated in traditional education. Restructuring with technology must take into account the teacher's: 1) centrism, 2) authority base, and 3) design involvement. Ravitch (1993) states:

> School organization has been traditionally hierarchical, bureaucratic....New technologies challenge this model.

We must recognize that one of the main reasons that new technologies have not been incorporated into the schools after their initial introduction is that the teachers have not been recognized as motivating forces but as workers. Teachers are the instructional leaders of their classrooms, yet their importance as individual authorities has been ignored, in the planning, introduction, and execution of many new programs (Cicchelli, 1982; Lipsitz, 1989). Meaningful adoption based on what is sure to be constant change requires the use of a new model.

Technology Adoption: Is it Exemplary in Distance Education?

There are five major issues in distance education: 1) a critical/reflective framework for the field, 2) access and equity, 3) dialog and independence, 4) technology, and 5) third world development (Evans & King, 1991). Distance learning technology changes rapidly, requiring constant adaptation (Pelton, 1990). Technology adoption is a key issue in distance facilitation because it is technology-dependent. Perhaps the issues and theory base that undergird distance education and make it successful in the introduction of technology needs to be examined in school technology integration.

The Need for a Pre-College Theory Base of Distance Education

The fast-growing use of satellite-based instruction, with another four consortiums being awarded a total of $18.2 million for the next two years (Electronic Learning, 1993), brings to 10 the number of multi-institutional consortiums that have received Star School funding. The need to look closely at the unique characteristics of high school distance education United States and Canada is now.

The research of Laube (1992) and others (Dillon, 1992; Speth, 1992; Speth, Poggio, & Glasnapp, 1992) working primarily with secondary distance education in the United States and Canada clearly show "no consistent trend with the findings...found in adult education" (Laube,

1992). The operating assumptions are different. Secondary students have different motivations, controls, and restrictions than do adult students. Secondary distance facilitators have different time and professional constraints, as well. With the use of distance education around the world in the pre-college setting and the rapidly growing population of United States and Canadian secondary distance learning it is essential that a theory base be constructed in order to better serve this constituency.

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